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(54) **Artificial fuel and fire.**

(57) An improved artificial fuel for use, loose, in simulated solid fuel fires to give the appearance and heat output of an open fire, wherein to form the fuel use is made of refractory ceramic fibre, bonded into an open structure that consists essentially of fibres, bonded where they cross and having free spaces between them, rather than a fired mass containing embedded fibres, the porosity of the structure being at least of the order of 60% but preferably more, advantageously 75% to 85%, and both fibre and bonding agent being capable of continuous service at not less than 1000°C.

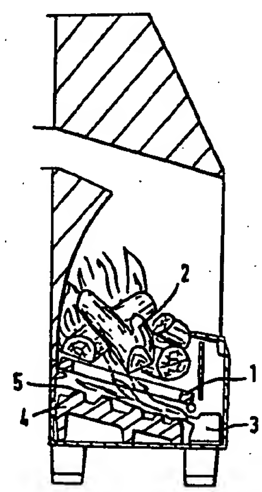

FIG.1

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ARTIFICIAL FUEL AND FIRE

The invention relates to artificial fuel for gas fires.

Fires in which some visual effect of an open fire is given, by gas flames playing between an artificial and incombustible 'fuel', have come into use. They are however wasteful of gas and, as they give little heat, do not give the atmosphere that is sought from an open fire.

We have sought an improved artificial fuel for use, loose, in simulated solid fuel fires and have found that desirable properties both in appearance and heat output are given if use is made of refractory ceramic fibre, bonded into an open structure.

By 'open' is meant that the structure consists essentially of fibres, bonded where they cross and having free spaces between them, rather than a fired mass containing embedded fibres. The porosity of the structure should be of the order of 60% but preferably more, advantageously 75% to 85%, and both fibre and bonding agent should be capable of continuous service at not less than 1000°C.

Such a structure has the desirable property of being able to carry stains and/or glazes that when fired colour the structure to look like logs, coal or coke with both 'unburnt' and 'ash' areas, and that also function as sealants restraining loss of fibre from the structure. Low thermal inertia is also shown giving quick response to impinging gas flame, capturing and re-radiating its heat. Desirably the fuel is glazed on all faces,

suitable glazes being standard pottery glaze frits for example those supplied as 'Blythe' colours by Johnson Matthey and applied in water suspension.

The material used in the fuel, with its low thermal inertia, arising from low heat conductivity and low thermal capacity, can glow locally without heating throughout. Gas burning locally, where it can most readily pass a support between pieces of the fuel, thus gives a good simulation of a real fire.

The response of the bonded fibre is believed to be due to the inability of individual heated fibres to lose any significant amount of heat by conduction and also to the open structure of the material at a microscopic level, freely exposed to heat.

The fuel may conveniently be produced by filter casting a slurry of a bonding agent, such as a bonding clay, and a refractory fibre, for example an alumina silica fibre. Process conditions are not critical, the casting process being insensitive to variations in proportions or type of material and for example to fibre diameter. Casting may be followed by firing.

In particular the fuel may conveniently be produced by filter casting onto a former of appropriate shape, drying the green form so produced, differentially colouring the dried green form to the desired pattern, and then firing in a kiln to a suitable temperature to make the colour fast. Flat bottomed pieces of fuel are directly cast. Pieces required in the round, as with logs, may conveniently be made in halves and stuck together with a slip of the bonding material while green.

A convenient former is shaped in plastics sheet material, with multiple holes covered by mesh inserts. Such formers are readily made to desired shapes and used in the filter casting process.

The invention also includes a gas-fire unit comprising a simulated fuel as above set forth supported on a refractory grid below which gas burns at suitable jet(s), the flames and heat passing the grid and impinging on the fuel. The grid may carry projections themselves designed to glow and give the impression of a deep fire. Below the grid may further be a refractory base over which the flames pass, with the same kind of projections if desired.

The accompanying drawings illustrate by way of example a gas fire using the simulated fuel of this invention.

In the drawings:

Fig. 1 is a sectional view of the fire, and

Fig. 2 shows various simulated logs.

The unit shown comprises a grid 1 having distributed over it the fuel 2 in the shape of logs, the spaces between the fuel allowing passage of flame from a burner 3 at the front of the fire. Below the grid is a base 4 having projections 5 which heat and glow in the flames.

The logs, as shown in Fig. 2, can be of various shapes and either flat bottomed (a, b) or of two parts fixed together to give 'in the round' shapes while preserving the simplicity of the casting process (c, d). Such two part logs are desirably cut across at the ends after the parts are fixed together, as shown at d), so that the

taper necessary for easy release from the casting moulds does not give an unconvincing shape at the ends of the log.

Example

Fuel to represent logs is made by vacuum casting in a shaped former as above, the casting material being a slurry of ceramic fibre with a bonding agent.

The fibre is an alumino-silicate material made from fused kaolin and has the following properties:-

Melting point	1760°C
Continuous Service Temperature	1260°C max.
Fibre Diameter, average	2.8 microns

Analysis:

Alumina, Al_2O_3	45.1%
Silica, SiO_2	51.9
Iron Oxide, Fe_2O_3	1.3
Titania, TiO_2	1.7
Magnesia, MgO	Trace
Calcium oxide, CaO	0.1
Alkalies as Na_2O	0.2
Boric anhydride B_2O_3	0.08

The bonding agent is ball clay.

The slurry is made from 5 parts by weight of fibre, having lengths of about 15cm to 25cm, two parts by weight of ball clay and 0.1 parts by weight of tricalcium phosphate flux. The more expensive boron phosphate giving a white product is not required in this application. The ingredients are mixed together in a chopper mixer so

as to produce a slurry in which the fibre lengths are for the most part between 0.025 and 1.25cm in length.

The vacuum casting gives a soft, pliable green shape which is dried at 150°C, giving a material that is still soft but brittle. After colouring, the material is fired in air at about 1050°C for half an hour, sufficient to bond the fibres. It becomes strong enough to resist handling or for example dropping onto a bench from a height of a foot to eighteen inches, though it is still friable if gouged for example.

The clay, in the amount used, is found not to affect the volume of the cast as compared to a cast made from the fibre alone, and acts only as a filler in the fibre structure. Considerable variations in binder content are possible, the limits being readily found for a given clay or other binder, for example colloidal silica, between insufficient cohesion in the fired fuel on the one hand and unduly slow casting and low porosity in the final radiant on the other. The preferred content of clay binder is about 2 parts by weight to 5 of fibre. The volume of this amount of fibre is of course far greater than the volume of the clay.

The colours are spray applied as water based glazes to give a simulated log effect.

CLAIMS:

1. An improved artificial fuel for use, loose, in simulated solid fuel fires to give the appearance and heat output of an open fire, wherein to form the fuel use is made of refractory ceramic fibre, bonded into an open structure that consists essentially of fibres, bonded where they cross and having free spaces between them, rather than a fired mass containing embedded fibres, the porosity of the structure being at least of the order of 60% but preferably more, advantageously 75% to 85%, and both fibre and bonding agent being capable of continuous service at not less than 1000°C.

2. Fuel according to claim 1, carrying stains and/or glazes that when fired colour the structure to look like logs, coal or coke with both 'unburnt' and 'ash' areas, and also function as sealants restraining loss of fibre from the structure.

3. Fuel according to claim 1 or 2, produced by filter casting a slurry of a bonding agent, such as a bonding clay, and a refractory fibre, for example an alumina silica fibre.

4. Fuel according to claim 3, produced by filter casting onto a former of appropriate shape, drying the green form so produced, differentially colouring

the dried green form to the desired pattern, and then firing in a kiln to a suitable temperature to make the colour fast.

5. A gas-fire unit comprising a simulated fuel as in claim 1, 2, 3 or 4, supported on a refractory grid below which gas can burn at suitable jet(s), the flames and heat passing the grid and impinging on the fuel and the grid optionally carrying projections themselves designed to glow and give the impression of a deep fire.

6. A unit according to claim 5, wherein below the grid there is further a refractory base over which the flames pass, optionally with projections as set out in claim 5.

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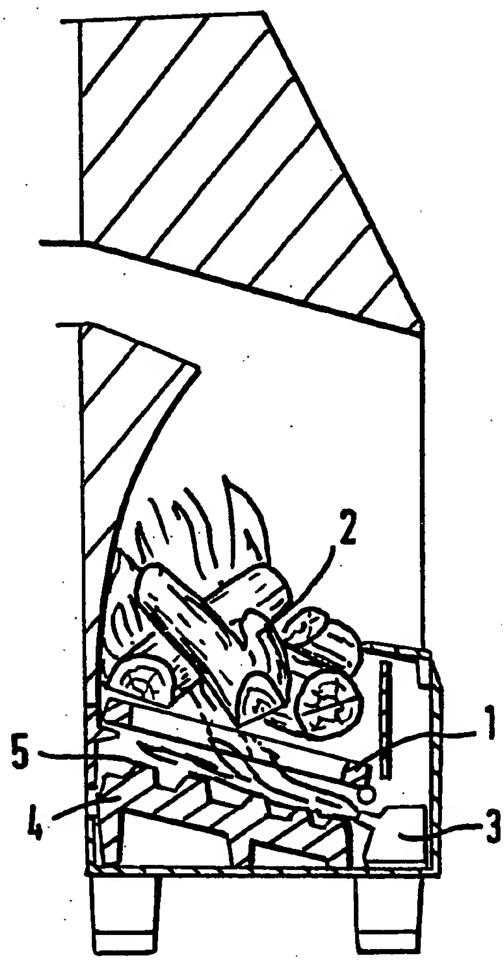

FIG.1

FIG. 2